

A New Species of Serranid Fish of the Genus *Anthias* from the Hawaiian Islands and Johnston Island¹

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ABSTRACT: The serranid fish *Anthias fucinus* is described from 15 specimens collected from steep rocky slopes at depths of 168–198 m in the Hawaiian Islands and 214–237 m at Johnston Island. It is unique among the known species of the genus in lacking vomerine teeth. Other diagnostic characters are 9 soft anal rays (of the Indo-Pacific species of *Anthias* only *A. ventralis* has this count); 16 dorsal soft rays; 15 or 16 pectoral rays (all unbranched); lateral line with a distinct angle at anterior end of straight peduncular part, the pored scales 34–36 (only *A. bouleengeri* from the Gulf of Oman has this number of pored scales); membranes of dorsal fin not incised; no prolonged dorsal spine (fourth or fifth spines barely longest); and a distinctive head color pattern of alternating stripes of violet and yellow.

THE FISHES OF THE GENUS *Anthias* (family Serranidae, subfamily Anthiinae) are small colorful species generally found on coral reefs or rocky bottoms in tropical and subtropical seas. They feed on zooplankton, usually in small aggregations a meter or more above the substratum, retiring to the shelter of the reef with the approach of danger. Because of their small size, they are not often caught by hook and line, and because of their association with hard irregular substrata, they are rarely captured in trawls. Most species live at depths greater than about 20 m. It was not until the advent of SCUBA that ichthyologists and aquarium fish collectors discovered the majority of the fishes of this genus that we know today. In a review of the literature of *Anthias*, Randall (1983) noted that 22 valid new species have been described from the Indo-Pacific region within the last decade. Anderson and Heemstra (1980) described two from the western Atlantic. Lubbock and Edwards (1981) named *Anthias salmopunctatus* as new from St. Paul's Rocks off Brazil. Still more remain on museum shelves to be named.

Randall (1979) reviewed the three Hawaiian species of *Anthias* known to him at that time, the endemic *A. thompsoni* (Fowler) and two widespread new species, *A. bicolor* and *A. ventralis*. The latter is subspecifically different in the Hawaiian region, hence was named *A. ventralis hawaiiensis*.

In November 1981 an unidentified 66-mm *Anthias* taken from the stomach of a large jack (*Caranx ignobilis*) collected by Farley Watanabe at St. Rogatien Bank in the Northwestern Hawaiian Islands was presented to the Bishop Museum. The jack was caught in 18 fathoms (33 m); the *Anthias*, however, was partially digested, thus could have been eaten at some other depth. Jacks of the genus *Caranx* are known to range individually over a broad range of depth; *C. ignobilis* has been observed off Hawaii by the senior author from a submarine at depths to 152 m. The head of the *Anthias*, much less digested than the body, was alternately striped with violet and yellow. Such a color pattern is not known for any other *Anthias*. Further examination confirmed the suspicion that this specimen represents an undescribed species; however, it was decided to wait for the collection of additional undamaged material for the description.

Dives in 1982 from the research submersible *Makali'i* by E. H. Chave, the authors, and others in the principal Hawaiian Islands

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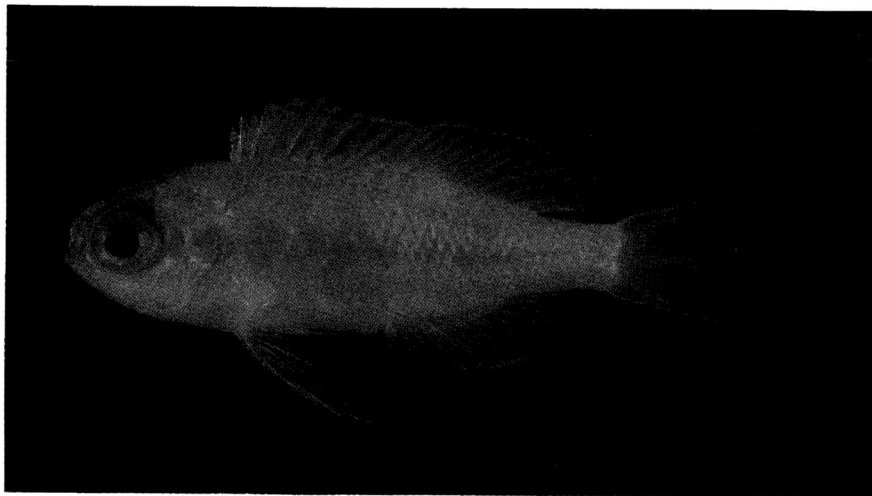


Figure 2. Paratype of *Anthias fucinus*, immature ♀, 35.8 mm SL, BPBM 29267, Johnston Island. Dorsal part of caudal fin broken.



Figure 3. Paratype of *Anthias fucinus*, ♀, 53.8 mm SL, BPBM 28123, Hawaiian Islands.



Figure 4. Holotype of *Anthias fucinus*, ♂, 54.6 mm SL, BPBM 28622, Hawaiian Islands.

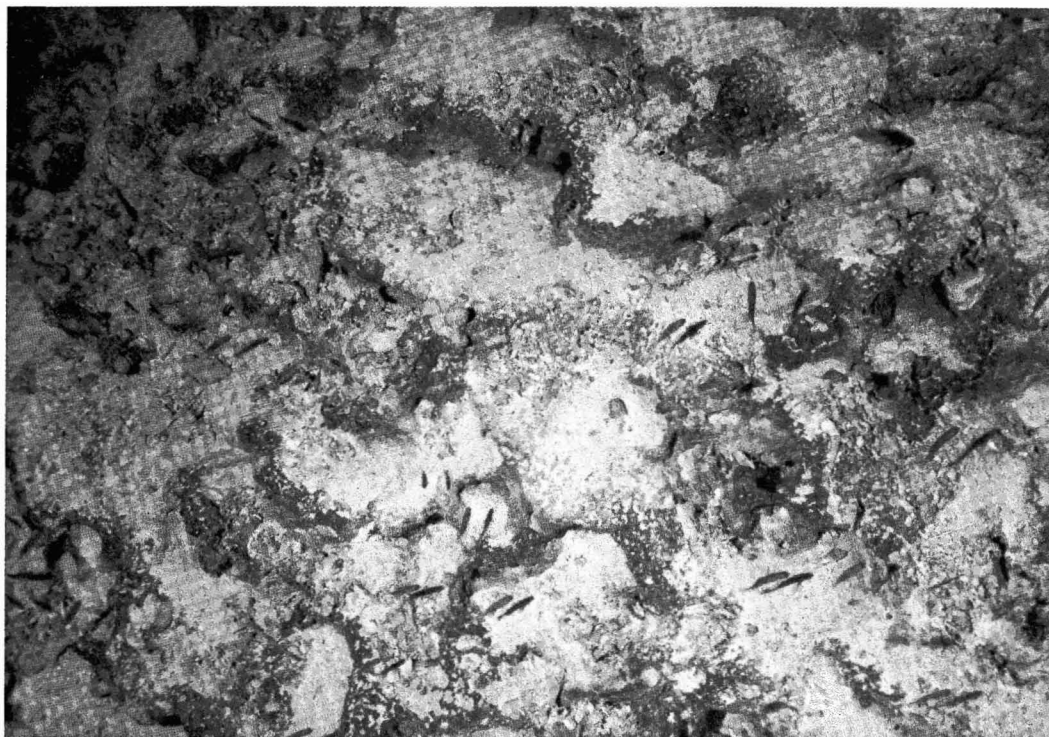


FIGURE 1. *Anthias fucinus* in 198 m off Johnston Island. Note that each fish has a well-defined shadow. Photograph from the submarine *Makali'i* by E. H. Chave.

revealed the abundant presence of this *Anthias* in the depth range of 135 to 210 m on steep, highly eroded slopes of ancient limestone. On 7 June 1982, Chave collected two specimens of the new *Anthias* in 198 m with rotenone from *Makali'i* at Penguin Bank off Molokai. The junior author collected four more from 168 m at the same locality on 15 September.

A year later a series of dives was made with *Makali'i* at Johnston Island by the authors, Chave, Phillip S. Lobel, and others. Again the *Anthias* proved to be abundant (Figure 1), this time in the depth range of 150–270 m. Lobel collected eight small specimens at the atoll from *Makali'i*.

The 15 specimens of the new *Anthias* are the basis for the present description. They have been deposited at the following museums: Australian Museum, Sydney (AMS); Bernice P. Bishop Museum, Honolulu (BPBM); British Museum (Natural History), London (BM[NH]); California Academy of Sciences,

San Francisco (CAS); National Science Museum, Tokyo (NSMT-P); Royal Ontario Museum, Toronto (ROM); J. L. B. Smith Institute of Ichthyology, Grahamstown, South Africa (RUSI); and National Museum of Natural History, Washington, D.C. (USNM).

The following definitions are given for the various measurements of fishes used in the present paper: standard length (SL) is the straight line distance from the front of the upper lip to the base of the caudal fin (posterior end of vertebral column); body depth is the maximum depth measured from the extreme base of the dorsal spines to the lowermost part of the abdomen (adjusting for any obvious malformation from preservation); body width is measured just posterior to the gill opening; head length is taken from the front of the upper lip in the median line to the posterior end of the opercular membrane; snout length is measured from the same anterior point to the fleshy edge of the orbit; orbit

TABLE 1
FIN RAY COUNTS OF HAWAIIAN SPECIES OF *Anthias*

SPECIES	DORSAL RAYS					ANAL SOFT RAYS				PECTORAL RAYS							
	X	XI	16	17	18	7	8	9	10	15	16	17	18	19	20	21	22
<i>bicolor</i>	26	2	1	21	6	26	2							10	17	1	
<i>fucinus</i>	15		15					15		7	8						
<i>thompsoni</i>	33		32	1		33									7	25	1
<i>ventralis</i>	19	1	1	17	2			19	1	19	1						

diameter is the greatest fleshy diameter of the orbit; interorbital width is the least bony width between the orbits; depth of caudal peduncle is the least depth; length of caudal peduncle is the horizontal distance from the rear base of the anal fin to the base of the caudal fin; fin spine and ray measurements are taken from their extreme bases (as seen from radiographs or from a bright light transmitted through the fish) to their distal ends; pectoral and pelvic fin lengths are the lengths of the longest rays; caudal concavity is the horizontal distance between verticals at the tips of the longest and shortest caudal rays.

Pectoral fin ray counts include the rudimentary upper ray; the last dorsal and anal fin rays are split to their base but counted as a single ray. Gill-raker counts include all rudiments; the raker at the angle is contained in the lower-limb count.

Data in parentheses in the descriptions below apply to paratypes. Proportional measurements are rounded to the nearest .05.

We provisionally place this new species in the genus *Anthias* pending a study of the generic classification of the Anthiinae. The need for such study has been expressed by Anderson and Heemstra (1980) and by Randall (1983).

Tables 1 to 3 provide a comparison of meristic data of the four Hawaiian species of *Anthias*.

Anthias fucinus, new species

Figures 1–4, Tables 1–4

HOLOTYPE: BPBM 28622, 54.6 mm SL, male, Hawaiian Islands, southwest end of Penguin Bank (20°52.4' N, 157°39.3' W), 170 m,

rotenone from the research submersible *Makali'i*, S. Ralston, 15 September 1982.

PARATYPES: BPBM 28350, 66.0 mm SL (partially digested, with tail nearly severed), Northwest Hawaiian Islands, St. Rogatien Bank, from stomach of *Caranx ignobilis* caught in 33 m, F. Watanabe, 18 November 1981; BPBM 28123, 53.8 mm SL, same locality as holotype, 198 m, rotenone from *Makali'i*, E. H. Chave, 7 June 1982; BM(NH) 1983. 12.22.3, 44.9 mm SL, same data as preceding; USNM 264611, 53.2 mm SL; RUSI 19798, 42.1 mm SL; AMS I.24334-001, 40.5 mm SL—all with same data as holotype; BPBM 29265, 3:22.7–24.0 mm, Johnston Island, outside reef at dump site (16°40.2' N, 169°31' W), 214 m, rotenone from *Makali'i*, P. S. Lobel, 13 September 1983; ROM 43016, 34.1 mm SL and CAS 54302, 27.9 mm SL, same data as preceding; BPBM 29267, 2:27.2–35.8 mm SL, Johnston Island, same locality as preceding, 237 m, P. S. Lobel, 14 September 1983; NSMT-P 22995, 33.0 mm SL, same data as preceding.

DIAGNOSIS: Dorsal rays X,16; anal rays III,9; pectoral rays 15–16, all unbranched; lateral-line scales 34–36; lateral line strongly arched anteriorly, only 1 1/2 scales separating it from middle and posterior dorsal spines, and forming an angle where straight peduncular part commences; no auxiliary scales; gill rakers 9–10 + 24–26; predorsal bones two; body depth 2.95–3.0 in SL; no papillae on posterior edge of orbit; front of upper lip of males not protuberant; no vomerine teeth; no prolonged dorsal spine (fourth or fifth spines longest, the remaining spines only slightly shorter); membranes of spinous portion of dorsal fin not incised; distal margin of soft

TABLE 2

LATERAL-LINE SCALE COUNTS OF HAWAIIAN SPECIES OF *Anthias*[illegible]

TABLE 3
GILL-RAKER COUNTS OF HAWAIIAN SPECIES OF *Anthias**

SPECIES	UPPER LIMB						LOWER LIMB							
	7	8	9	10	11	12	22	23	24	25	26	27	28	
<i>bicolor</i>					13	15					6	15	7	
<i>fucinus</i>			5	7					6	5	1			
<i>thompsoni</i>				2	24	7				3	9	15	6	
<i>ventralis</i>	1	14	5				4	7	6	3				

* Gill-raker counts were made on the first arch and include all rudiments; the raker at the angle is contained in the lower-limb count.

TABLE 4
PROPORTIONAL MEASUREMENTS OF TYPE SPECIMENS OF *Anthias fucinus*
EXPRESSED AS A PERCENTAGE OF THE STANDARD LENGTH

	HOLOTYPE			PARATYPES				
	BPBM 28622	BPBM 29265	BPBM 29267	AMS 1.24334-001	RUSI 19798	BM(NH) 1983.12/22/3	USNM 264611	BPBM 28123
Standard length (mm)	54.6	24.0	35.8	40.5	42.1	44.9	53.2	53.8
Body depth	33.5	33.1	31.5	31.9	33.3	34.1	32.8	31.4
Body width	15.6	16.7	16.5	15.1	15.9	16.9	16.9	15.4
Head length	33.0	36.6	34.8	34.8	33.7	33.9	34.7	33.0
Snout length	7.5	7.9	6.8	7.9	7.1	7.0	7.5	7.6
Orbit diameter	11.7	14.9	13.5	12.0	12.0	11.8	11.7	10.4
Interorbital width	7.3	7.7	7.7	7.7	7.1	7.2	7.3	7.1
Upper jaw length	16.5	16.5	16.8	16.0	16.5	16.2	15.8	15.1
Caudal peduncle depth	12.4	12.5	12.6	12.3	12.1	12.0	12.2	11.9
Caudal peduncle length	17.9	18.3	19.7	17.6	17.1	18.7	17.4	17.3
Predorsal length	31.7	34.4	33.2	34.6	33.7	33.0	32.6	32.7
Preanal length	60.0	61.2	60.1	61.0	61.3	60.1	61.0	62.1
Prepelvic length	33.2	33.2	34.1	33.6	33.0	32.1	33.4	33.1
Length of dorsal fin base	59.5	51.3	57.1	57.0	60.1	60.4	60.4	59.3
Length of first dorsal spine	7.3	8.4	7.8	7.9	8.5	7.8	7.2	7.4
Length of second dorsal spine	9.3	12.1	10.0	9.9	11.1	10.9	11.7	10.0
Length of longest dorsal spine	17.3	16.5	15.7	16.5	17.1	16.7	16.3	17.6
Length of tenth dorsal spine	16.1	14.7	14.7	15.8	16.6	15.6	15.4	17.6
Length of longest dorsal soft ray	22.5	20.8	20.9	19.2	19.5	21.6	20.7	20.9
Length of anal fin base	24.6	21.4	22.7	24.2	24.7	23.4	25.0	23.6
Length of first anal spine	6.6	8.1	7.0	7.2	7.4	7.8	6.8	6.6
Length of second anal spine	15.7	15.0	14.9	14.5	15.0	15.5	15.1	15.2
Length of third anal spine	17.7	15.4	15.2	14.5	16.5	15.6	16.6	16.3
Length of longest anal soft ray	26.2	21.2	21.5	20.2	20.0	20.9	24.8	24.2
Caudal fin length	47.5	broken	broken	broken	45.6	55.7	49.8	47.4
Caudal concavity	27.3	—	—	—	25.7	33.4	28.8	28.6
Pectoral fin length	35.6	35.9	33.7	36.8	36.1	39.0	36.0	36.4
Pelvic spine length	16.8	18.1	17.2	15.6	16.2	16.0	17.3	16.4
Pelvic fin length	43.6	30.0	36.1	36.8	41.1	37.2	40.3	37.9

portion of anal fin rounded; caudal fin lunate; pelvic fins long, 2.3–3.3 in SL; males with alternating stripes of violet and yellow on head; body yellow, suffused with orange-red on side below posterior part of dorsal fin, with irregular continuations of the violet stripes onto body, mainly broken into spots; females similar in color to males but dominantly yellow (the violet markings faint and the orange-red of the body largely absent).

DESCRIPTION: Dorsal rays X,16; anal rays III,9; pectoral rays 15 (15–16); pelvic rays I,5; principal caudal rays 15 (uppermost and lowermost unbranched); upper procurrent caudal rays 9; lower procurrent caudal rays 9; lateral line scales 35 (34–36); scales above lateral line to origin of dorsal fin $4\frac{1}{2}$; scales below lateral line to origin of anal fin 11; circumpeduncular scales 18; diagonal rows of scales on cheek between posterior edge of orbit and corner of preopercle 6; near-vertical rows of scales on opercle at level of middle opercular spine 4; gill rakers 10 + 24 (9–10 + 24–26); pseudobranchial filaments 12 (9–12, increasing with growth); branchiostegal rays seven; predorsal bones two, poorly developed (faint on radiographs), diagonal, the first anterior to first neural spine, the second pointing toward space between first and second neural spines (but not entering that space); vertebrae 10 + 16.

Body depth 3.0 (2.95–3.2) in SL; body width 2.15 (1.9–2.1) in depth; head length 3.0 (2.75–3.0) in SL; snout length 4.4 (4.35–5.1) in head; orbit diameter 2.8 (2.45–3.2) in head; interorbital space convex, the least width 4.5 (4.5–4.75) in head; least depth of caudal peduncle 2.65 (2.75–2.9) in head.

Mouth terminal, oblique (forming an angle of about 45° to the horizontal), the maxilla nearly reaching a vertical through rear edge of pupil, the upper jaw length 2.0 (2.05–2.2) in head; upper lip without an anterior fleshy protuberance (as seen in males of the subgenus *Mirolabrichthys*); upper jaw with a pair of small slender strongly recurved canine teeth anteriorly, separated by a gap at symphysis about equal to one-third orbit diameter (some paratypes with two close-set canines on each side); a row of slender canines along side of

upper jaw posterior to anterior canines, these teeth progressively longer posteriorly, all but the first few curved anteriorly; an inner band of about three rows of small recurved teeth anteriorly in upper jaw, except for a large inner recumbent canine on each side of symphysis, the band soon narrowing to a single row along side of jaw; lower jaw with a pair of projecting medially curved canines anteriorly, a stout strongly recurved canine (or two such teeth) about one-fourth distance from front of jaw, and a single row of small slender canines along side of jaw, those toward the front curving posteriorly and those toward the rear curving anteriorly; three irregular rows of small incurved teeth behind anterior canines; vomer without detectable teeth; a few minute papillae on vomer and roof of mouth; palatines with about 15 very small teeth in two irregular rows. Tongue narrow and pointed, without distinct papillae. Gill rakers slender and long, the longest about half orbit diameter. Gill membranes free from isthmus.

Anterior nostril in a short membranous tube slightly above level of center of eye; posterior nostril a large irregular opening diagonally posterior and above the anterior; a very large pore directly in front of posterior nostril; a smaller but prominent pore in interorbital space above front of pupil of each eye; posterior half of orbit rimmed by a series of about 15 pores; no papillae along posterior edge of orbit; a series of five large pores along lower side of each mandible, and a pair of smaller pores at tip of chin.

Opercle with three flat spines, the largest and most posterior in the middle, closer to lower than upper spine; posterior margin of preopercle with 31 (12–35 serrae, the number increasing with growth) which are progressively larger ventrally; lower margin of preopercle and margins of subopercle and interopercle smooth.

Scales weakly ctenoid; no auxiliary scales; head scaled except lips, mandible, and snout (scales dorsally on head extending to level of posterior nostrils); no scales on dorsal and anal fins except for a row of small scales at extreme base (two rows anteriorly at base of anal fin); small scales extending more than half-way to posterior border of caudal fin and

on about basal third of pectoral fins; pelvic axillary scale small (exposed part in holotype 0.7 mm); a triangular scaly process extending posteriorly from between bases of pelvic fins.

Lateral line complete, strongly arched anteriorly (only $1\frac{1}{2}$ scales separating it from middle and posterior dorsal spines) and forming a distinct angular part of one pored scale between curved dorsoanterior part and straight mid-lateral peduncular portion; last pored scale at end of hypural plate; tubules of lateral line simple and straight, covering nearly all of exposed part of scales.

Origin of dorsal fin slightly anterior to a vertical through upper end of gill opening; membranes of spinous portion of dorsal fin not incised; first dorsal spine about three-fourths length of second; fourth or fifth dorsal spines longest, 1.9 (1.85–2.2) in SL, the remaining spines nearly as long; sixth or seventh dorsal soft rays longest, 1.45 (1.55–1.8) in head; first dorsal soft ray unbranched, the remaining soft rays and all of the anal soft rays branched, the last to base; first anal spine about half length of second; second anal spine slightly stouter than third but slightly shorter; third anal spine 1.85 (2.0–2.4) in head; margin of anal fin rounded, the fifth or sixth rays longest, 1.25 (1.35–1.7) in head; caudal fin lunate, the lobes filamentous in adults, the caudal concavity 3.65 (3.0–5.0) in SL; pectoral fins moderately long, 2.8 (2.55–2.95) in SL, the rays unbranched; pelvic fins very long and filamentous (second soft ray longest), 2.3 (2.4–3.3) in SL.

Color of holotype in alcohol pale, the only dark pigment being a trace on anterior upper side, particularly along the front half of the lateral line where it forms a series of 17 small dusky spots. The paratypes lack dark pigment (though the 66-mm one from the jack stomach might have had this before it became a meal).

Color of holotype (a male) when fresh: head with alternating violet and yellow stripes, the uppermost violet band following dorsal contour of head, the second extending posteriorly from upper part of orbit, the third beginning at front of snout and passing through lower part of eye, the fourth extending posteriorly from maxilla; and the faint lowermost mid-ventral on head; tip of lower jaw violet; body

yellow, suffused with dull orange-red below posterior part of dorsal fin, with continuations of the violet stripes from the head, mainly as large irregular spots (the stripe from lower part of eye best developed, but very irregular with ventral extensions; see Figure 4); dorsal and anal fins lavender-blue with a violet margin (closer to pink on spinous portion of dorsal) and an irregular streak of dull yellow on most membranes paralleling rays; basal part of caudal fin yellow with violet markings, the outer part yellowish with lavender-blue markings, the upper and lower margins violet, the filaments yellowish; pectoral fins with clear membranes and pale pink rays; pelvic fins pale lavender-blue with a streak of yellowish on second to fifth rays, the filamentous ends of rays pink; iris with an inner ring of yellow and an outer of violet.

The color of the 53.8-mm female paratype (Figure 3) when fresh was basically the same as the male holotype but the violet stripes were poorly developed and the orange-red color on the upper side below the posterior part of the dorsal fin largely absent; there was more pale yellow and less blue on the dorsal, anal, and pelvic fins.

The color of the 35.8-mm subadult (Figure 2) was similar to the mature female, the most notable difference being an irregular streak of dull orange extending posteriorly from the orbit between the two lateral irregular pale violet bands of the head and body.

REMARKS

This lovely anthiine is named *fucinus* from the Latin for colored with orchil (a violet dye). It is at present known only from the Hawaiian Islands and Johnston Island.

In the Hawaiian Islands the species was common on the steep reef face of highly eroded limestone at depths of 135 to 210 m. The reef surface was pitted and cut with erosional channels about 3–40 cm deep which provided shelter for the fish. A fine layer of silt or sand covered the few near-horizontal surfaces. Except for occasional ahermatypic corals (yellow *Tubastrea*), the slope was nearly barren of sessile invertebrates. A species of

galatheid crab, however, was abundant at the collection sites. Species of fishes associated with *Anthias fucinus* included *Holanthias fuscipinnis*, *Callanthias* sp., *Symphysanodon maunaloae*, *Suezichthys notatus*, and *Chaetodon modestus*. The most common larger predaceous fishes were *Seriola dumerili* and *Pristipomoides filamentosus*. The water temperature at the collection sites was 18°C.

At Johnston Atoll (16°44' N) *Anthias fucinus* occurs in a comparable habitat but somewhat deeper, 150–270 m, with the peak abundance at 215 m. The temperature in this zone averaged 17°C. This suggests that sea temperature might control the depth distribution of the fish (i.e., to attain 17–18° water the fish must live at a greater depth at the atoll). One might expect the water off Johnston Island to be clearer than in the Hawaiian Islands, thus light would penetrate deeper and the level of illumination might be the major factor determining the depth at which this fish lives. However, measurements of water clarity at Penguin Bank (where the collections and most observations of *A. fucinus* were made) were essentially the same as those for the sea off Johnston (E. Chave, pers. comm.).

Anthias fucinus is not closely related to any known species of *Anthias*. It is unique in lacking vomerine teeth and in having all its pectoral rays unbranched as an adult. It is distinct from all species except *A. ventralis* (and less than 5 percent of the western Atlantic *A. tenuis* Nichols) in having nine soft anal rays. It has a lateral-line configuration similar to the Atlantic species of *Anthias* and *A. bouleengeri* Heemstra from the Gulf of Oman (other Indo-Pacific *Anthias* have a smoothly curved lateral line without an angle at the start of the peduncular portion). The lateral-line scale count of *A. fucinus* (34–36) separates it from

all Indo-Pacific species of the genus except *A. albofasciatus* Fowler and Bean. Only *A. bouleengeri* has a lower lateral-line scale count (29–31). Both *A. albofasciatus* and *A. bouleengeri* have 14 dorsal and 7 anal soft rays, hence are readily separated by these counts from *A. fucinus*.

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